

REMARKS

The present amendment is submitted in response to the Office Action mailed May 9, 2001, which set a three-month period for response, making this amendment due by August 9, 2001.

Claims 16-31 are pending in this application.

In the Office Action, the drawings were objected to for failing to comply with 37 CFR 1.84(p)(4) because reference character "61" was used to designate both rotor shaft and axial bearing bush. Claims 16-31 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite. Claims 16-31 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,031,306 to Permuy in view of U.S. Patent No. 4,818,911 to Taguchi et al and U.S. Patent No. 4,680,514 to Sudler.

Looking first at the objection to the drawings, the specification has been amended on page 8, line 10, to change the typographical error "rotor shaft 61" to – rotor shaft 51 -- . Reference numeral "61" is intended to designate the axial bearing bush, as illustrated in the figures.

Regarding the rejection of claims 16-31 as indefinite, claim 21 was amended to provide that the shaft "extends" through the printed circuit board device from one side of the board device to a stop and the objected-to term "passable" was deleted. Claim 31 was amended to delete the term "the later", and to provide that the stator winding is located on the stator core coil region.

Regarding the rejection of claim 16 as unclear as to the relationship of the "attachment device" and the "frame" surrounding the shaft, the Applicants respectfully direct the Examiner's attention to the specification on page 7, last paragraph, to page 8, third paragraph, where the arrangement of the lid (i.e., "the attachment device") on the circuit board is described. This portion of the specification, along with Figures 1 and 2, describe and illustrate how a portion of the circuit board device forms a part of a frame surrounding the rotor shaft.

In order to more clearly set forth this structure, the Applicants have amended claim 16 to replace "attachment device" with -- lid --. As described in the specification, the shaft drive device is mounted directly to a circuit board by means of a cover or lid which is inserted onto the side of the printed circuit board facing away from a pointer instrument and which holds the rotor device and the stator device to the circuit board. This assembly, then, does not require the use of a complete stepping motor housing on the PCB device. A pointer instrument, therefore, can be very flat since the structural height of the shaft drive device is reduced, because the PCB device, together with the lid, holds the stator and rotor devices without the need for further covers or holding elements. In the case of a PCB device which also has a dial, then, additional plates are not needed. In this regard, the assembly of a pointing instrument with pointers is extremely simplified and the required space for the pointing instrument is reduced.

In order to more clearly distinguish the above features of the present invention from the cited references, claim 16 has been amended further to include the limitations of claim 26, namely, that the lid is locked into the printed

circuit board device. (Claim 26 has therefore been canceled). The Applicants respectfully submit that none of the cited references, whether viewed alone or in the suggested combination, show or suggest the present invention as now claimed.

The reference to Permuy discloses an electric motor which includes its own control, circuit board in the interior of the electric motor. The stepping motor housing includes cooling vanes or ribs, which dissipate heat to the exterior of the housing. The stepping motor has a cylindrical housing 2 and an end plate which is clipped in the housing 2 (see Permuy, column 2, lines 50 through 61).

The patent to Taguchi describes a stator of an electric motor which is connected to a printed circuit board. The stator is contained in a housing which is connected to a end plate 20 by means of legs 14 (see Taguchi, column 6, lines 27 through 36).

Sudler discloses a stepping motor, which drives a pointing instrument via gear wheels.

The Applicants respectfully submit that none of these references shows or suggests the invention as recited in amended claim 16. Permuy provides no suggestion that the cover can be inserted into the printed circuit board. In addition, Permuy's cover is directly connected to the end plate 4 and therefore completely surrounds the circuit board. The circuit board lies in the interior of the stepping motor so that, already, on this basis, the practitioner is lead away from the proposition of having a dial on this circuit board, since Permuy's circuit board is completely covered. Further, Permuy provides no suggestion of providing the

circuit board on the outside of a cover 4, that is, clipping the cover together with the circuit board, in order to form a frame from the cover and the circuit board for the stator and the rotator.

Even if Permuy is combined with the secondary references to Taguchi and Sudler, as suggested, the present invention cannot be viewed as obvious. Taguchi provides no suggestion that a housing 10, or a housing side 11, can be inserted into the circuit board. In addition, the circuit board is arranged on the stator and the stator is connected with an endplate, which is joined to the housing 10. Taguchi simply provides no suggestion of mounting the housing 10 directly onto the circuit board.

Likewise, Sudler does not show or suggest arranging a printed circuit board on a dial. Furthermore, Sudler actually teaches away from the present invention by providing an additional gear wheel drive between the motor and the dial, rather than a shaft drive device. Sudler provides no teaching to the practitioner of using an electric circuit board which serves to both secure the cover of the shaft drive device and simultaneously support a dial.

Thus, even if the practitioner were to combine the cited references, he would not be lead to the present invention as claimed. Claims 16-25 and 27-32, therefore, cannot be seen as obvious over this combination of references. The Applicants respectfully request withdrawal of the rejection of the claims under Section 103 and reconsideration of the claims as herein amended.

In light of the foregoing amendment and argument in support of patentability, the Applicants respectfully submit that this application now stands in

condition for allowance. Action to this end is courteously solicited. Should the Examiner have any further comments or suggestions, the undersigned would very much welcome a telephone call in order to discuss appropriate claim language that will place the application into condition for allowance.

Amend as attached:

IN THE SPECIFICATION:

On page 8, please amend the paragraph contained in lines 7 through 11 as follows:

-- To make the pointer instrument complete, the point 8 is mounted on the rotor shaft 51 from the front side of the PCB device 1. On its other side, the rotor shaft [61] 51 is braced in the axial bearing bush 61 of the lid 6. --

Amend as attached:

IN THE CLAIMS:

16. (Amended) A shaft drive device for a pointer of a gauge instrument, comprising a printed circuit board device with a dial; a rotor device with a rotor and a rotor shaft attached to said rotor; a stator device for driving said rotor with said rotor shaft; [an attachment device] a lid for attaching said rotor device and said stator device to said printed circuit board device in such a way that said printed circuit board device forms a part of a frame surrounding said rotor shaft, wherein said lid is locked in said printed circuit board device.

21. (Amended) A shaft drive device as defined in claim 16, wherein said rotor shaft [is passable] extends through said printed circuit board device from a side of said printed circuit board device to a stop, with said rotor remaining on another side of said printed circuit board device.

24. (Amended) A shaft drive device as defined in claim 23, wherein said [attachment device] lid is formed so that it axially supports said rotor shaft on an opposite side of said printed circuit board device.

25. (Amended) A shaft drive device as defined in claim 24, wherein said [attachment device has a] lid [which] is attachable to another side of said printed circuit board device and which has an axial bearing bush for receiving a corresponding end of said rotor shaft.

31. (Amended) A shaft drive device as defined in claim 16, wherein said stator device is formed as a unit including a stator core coil region, a stator winding location on [the later] said stator core coil region, and a stator arm region.

Please add the following new claim:

32. A shaft drive device as defined in claim 16, wherein said printed circuit board has first and second sides, where said dial and said pointer are arranged on said first side of said printed circuit board device and wherein said stator device, said rotor device, and said lid are arranged on said second side of said printed circuit board.

✓ Please cancel claim 26.